



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :

A61L 2/06, 2/24, 2/20

A1

(11) International Publication Number:

WO 00/54818

(43) International Publication Date: 21 September 2000 (21.09.00)

(21) International Application Number: PCT/GB00/00928

(22) International Filing Date: 14 March 2000 (14.03.00)

(30) Priority Data:

9905943.8

15 March 1999 (15.03.99)

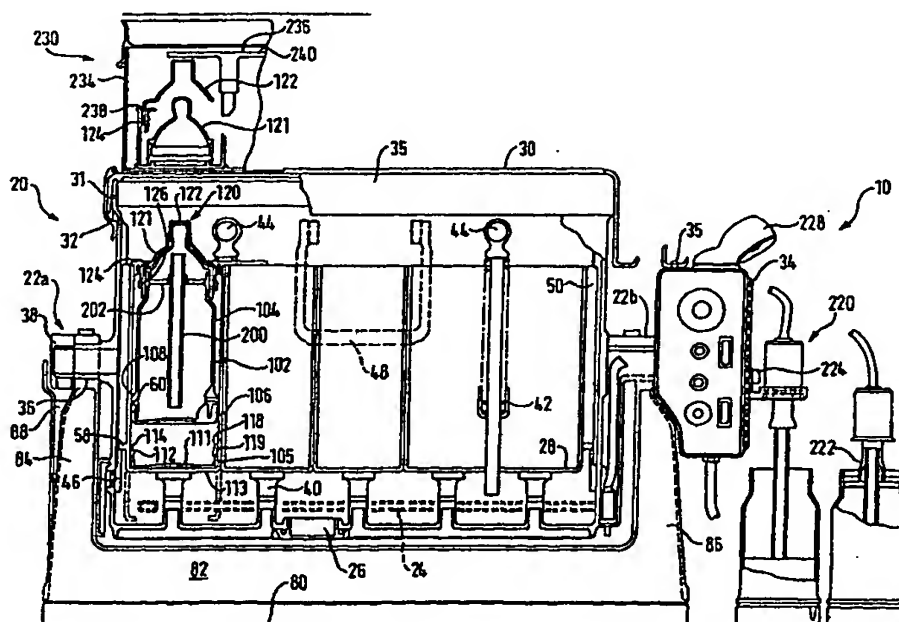
GB

(71) Applicant: JACKEL INTERNATIONAL LIMITED [GB/GB];
Dudley Lane, Cramlington, Northumberland NE23 7RH
(GB).(72) Inventor: RICHARDS, David, Charles; Manor House, Everton
Road, Everton, Nr. Lymington, Hants SO41 0HE (GB).(74) Agents: ROBERTS, Gwilym, Vaughan et al.; Kilburn &
Strode, 20 Red Lion Street, London WC1R 4PJ (GB).(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG,
BR, BY, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES,
FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP,
KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA,
MD, MG, MK, MN, MW, NO, NZ, PL, PT, RO, RU, SD,
SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ,
VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW,
SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY,
KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH,
CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,
PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN,
GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

(54) Title: APPARATUS FOR STERILISING UTENSILS AND FEED PREPARATION



(57) Abstract

A bottle steriliser comprises a reservoir and a basket for holding at least one bottle body spaced from a closure. The reservoir is filled with a sterilising medium, for example boiling water, and then closed. As a result the bottle is kept in an entirely sterile state. When it is desired to prepare a feed, the bottle can be heated up to the desired temperature, drained to the appropriate level, feed added and the preparation completed in a very short time.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

APPARATUS FOR STERILISING UTENSILS AND FEED PREPARATION

The invention relates to a steriliser for feeding bottles, for example an apparatus for sterilisation of feeding utensils and preparation of feed, and a method of
5 sterilising feeding bottles.

Currently the sterilisation of infant feeding bottles and preparation of the feed are complex and time consuming procedures. The components of the feeding bottle – generally a container or body, a teat and a flange or collar for holding
10 the teat on the body, usually by a screw fit – are sterilised by boiling or steaming for a pre-determined period in a pan, microwave or specialised unit. The bottle body receives boiled water and infant feed mix, for example milk powder, in desired quantities, and the feed is then heated to the correct
15 temperature. Obtaining the desired quantity of water is also problematic, and generally involves a trial and error approach. The preparation time involved is significant, especially if the infant is demanding feeding. A further problem is that it is not possible to prepare feeds more than a few hours in advance for health reasons, as the feed degrades quickly, and must be used within three hours if left out and only twenty four hours even if it is refrigerated. Even the
20 sterilised bottles only remain sterile to an acceptable degree for a short length of time because of air contamination. As a result in a given household it is currently necessary to repeat the sterilisation and preparation processes for small numbers of bottles regularly, rather than dealing with large batches less often.

25

A particular problem arises with night time feeds, where it is necessary to heat the prepared feed in the middle of the night which is highly disruptive.

Typically the feed is pre-prepared by sterilising the bottle, boiling the water for four minutes, adding the feed mix and leaving the pre-prepared bottle(s) in the refrigerator. The steps of retrieving the bottle from the refrigerator and heating it to the correct temperature are time consuming and inconvenient, especially in the middle of the night.

According to the invention there is provided a steriliser for a feeding bottle having an open bottle body and a closure comprising a sterilising medium reservoir, means for retaining an open feeding bottle body immersed in and filled with the sterilising medium and means for sealing the closure against the bottle body in its filled state. As a result the bottle and medium are retained in a sterile state, indefinitely, sealed against air contamination, without the need for human intervention. The invention therefore provides a complete baby feed centre, allowing sterilisation of large batches of bottles at once. The sealed bottles may further be retained at the feed temperature for immediate use simply by adding the feed mix. Such a baby feed centre allows a range of steps that would previously have required a variety of equipment to be carried out quickly and efficiently in a single unit dealing with sterilisation, bottle sealing and allowing for night-time feeds, with no compromise in hygiene.

20

The sealing means may comprise means for biasing the bottle body and closure towards one another, and detent means for retaining the bottle body and closure apart in a first position, and for releasing the bottle body and closure to seal against each other in a second position, providing simple and easy to manufacture sealing means.

25

A holder may be provided for at least one bottle body and closure insertable into the reservoir, allowing the bottles to be dealt with in pre-assembled batches. The holder may be arranged to slide relative to the reservoir, and one of the bottle body and closure may be arranged to slide relative to the holder and remain fixed relative to the reservoir, to seal the closure against the bottle body. The reservoir may include a stop arranged to retain one of the bottle and body fixed relative to the reservoir as the holder slides, to seal the closure against the bottle body. The reservoir may be pivotally mounted relative to a base, and have a sterilising medium inlet at its lower end. As a result the reservoir is easily inverted for filling. The inversion step ensures that air bubbles are eliminated and optimum exposure to the sterilising medium.

The reservoir may have a sterilising medium outlet communicating with a waste reservoir in a base such that drainage is simple and clean.

The reservoir may be detachably mounted to a base allowing portability.

The steriliser may further comprise control means for initiating sealing of the bottle body and closure after a predetermined sterilising period allowing automatic operation.

The steriliser may comprise a heating element and the sterilising medium may be water. The reservoir may be substantially water and gas tight, and include openable steam vents and means for sensing an open state of the vents to allow heating in a safe manner.

The feeding bottle holder may comprise a body including a plurality of formations for holding one or more of a bottle body, closure, teat, teat collar, and teat cover in spaced relation for steam sterilising, and a further plurality of formations for holding said closure and said bottle body spaced from one another and movable into sealing engagement with one or another.

A holder for a teat may be arranged to be attached to the reservoir in communication with the vents to allow steam sterilising of the teat such that waste steam is put to use.

A feeding bottle for a steriliser may have a bottle body which comprises bottle side walls, and the closure may comprise a bottle base which is a sealing snap fit with the side walls.

The invention further comprises a feeding bottle comprising a bottle body and an outlet conduit extending into the bottle body such that the bottle is drainable via the conduit to a predetermined depth removing the need for careful measuring by trial and error. A feeding bottle drainage unit may comprise a pump arranged to engage the outlet conduit to drain the bottle to the predetermined depth.

The invention further comprises a teat assembly for a feeding bottle comprising a teat, a collar for mounting the teat to a feeding bottle body, a cover sealable against the collar, and a sealing holder including a formation against which the collar seals the teat in a substantially gas- and water tight manner such that the assembly is retained sterile indefinitely.

The cover may have a profile substantially similar to the teat profile to retain the teat's shape during heating and cooling..

5 The invention further comprises a feed preparation unit comprising a sterilisation container comprising a heating element, water inlet and outlet, and means for holding feeding bottle components for steam sterilisation or water heating in the container such that a single, multi-purpose unit is provided.

10 According to the invention there is further provided a method as set out in the claims.

Embodiments of the invention will now be described, by way of example, with reference to the figures of which:

15 Fig. 1 is a partially cutaway side view of a feeding bottle steriliser according to the invention;

Fig. 2 is a plan view of the steriliser of Fig. 1;

Fig. 3 shows a teat assembly according to the present invention;

20 Fig. 4 is a side view of the feeding bottle steriliser shown in various possible positions;

Fig. 5 is a sectional view of a sterilising basket for use with the present invention;

Fig. 6 shows a detail of the arrangement shown in Fig. 1;

Fig. 7 shows a further detail of the arrangement shown in Fig. 1;

25 Fig. 8 is a partially cutaway side view of a further preferred embodiment of the invention;

Fig. 9 is a plan view of the embodiment of Fig. 8;

Fig. 10 is a schematic view showing an aspect of operation of the embodiment of Figs. 8 and 9;

Fig. 11a is a partially exploded sectional view of a further alternative bottle embodiment;

5 Fig. 11b is a sectional view of a further alternative bottle embodiment; and
Fig. 11c is a sectional view of yet a further alternative bottle embodiment.

The basic principles of the system can be understood from a consideration of Fig. 1. The steriliser is designated generally 10 and comprises a container 20, a
10 basket 50 and a base 80. The term "steriliser" is used for convenience although it will be recognised that the apparatus fulfils various additional functions as discussed below. In the first embodiment, the container 20 is pivotally mounted on the base 80 by pivots 22a, 22b and includes a heating element 24 which can be a rod-like or a plate-like element of any appropriate known type. The
15 container receives the basket 50 including a plurality of bottles 100. Each bottle 100 includes a teat assembly 120 including an air tight closure cap 122 and a bottle body 102 including, in the embodiment shown, a generally cylindrical side wall portion 104 and a base portion 106, which are a snap-fit together. The basket 50 is pre-loaded as discussed in more detail below with the side wall
20 portion 104 and base portion 106 of the bottle body 102 separate.

The container is water tight and includes a threaded filler cap 26 at the bottom such that the container 20 is pivoted to an inverted position to be filled with water. In its principal use, the container is inverted, filled with water such that
25 the bottles 100 are fully immersed and filled with water, returned upright, and the water is then boiled. Once the water has boiled for a sufficient time for it to

be fully sterile, the preloaded basket 50 is released to snap fit the side wall 104 and base portions 106 of the bottle body 102 together.

5 The bottles 100 are then entirely filled with sterile water sealed against contamination, allowing them to be stored indefinitely. In the preferred arrangement, the heater element 24 is thermostat controlled to lower and retain the temperature of the water in the container 20 at the desired feed temperature. Accordingly, when the infant requires feeding, a bottle can be retrieved, water
10 poured out or in the preferred embodiment as discussed below, pumped out to the required level and feed mix added. The feed is then ready, at the correct temperature, in a very short time.

In an initial step the arrangement is used as a steam steriliser. At this stage the container is partially filled with water either via the filler cap 26 or a cover 30
15 for the container 20. According to this arrangement all of the components of the feeding bottle can be steam sterilised, preferably for eight minutes as is conventional. As discussed in more detail below, Fig. 5 shows the components mounted in an alternative manner in the basket 30 such that they are all separated for optimum steam circulation, and the basket in this configuration is
20 placed inside the container for steam sterilisation. Alternatively the basket can be placed on top of the container whilst the water is being boiled as discussed above, in which case steam from the boiling operation circulates through the upper basket via steam vents. In a further alternative discussed in more detail below, the teat assemblies can be placed on top of the container for steam
25 sterilisation in a similar manner. Any variant or combination of these configurations can also be adopted. The steam sterilised components can then be reassembled in the basket for boiling of the water as discussed above in a

fully sterile condition. The arrangement discussed above, and further inventive features, are set out in more detail below.

5 The container 20 includes a main body 28 and a cover 30 which is fastenable watertight to the main body, for example by a seal 31 and over centre clip 32. The container 20 includes a controller 34 mounted adjacent a pivot 22b for ease of rotation of the container. One of the pivots 22a also includes a water outlet 36 openable by a twist cap 38 allowing drainage into the base 80 as discussed in more detail below. The main body 28 and cover 30 are preferably molded from
10 plastics material. The cover 30 includes a slidable steam vent arrangement shown schematically at 33, slidable between a closed, watertight position and an open, vented position. In the vented position, a switch 35 is preferably actuated by engagement with the vent arrangement 33. As a safety control, the element 24 will only switch on when the switch 35 is actuated, such that the
15 water is only heated when the vents 33 are open.

The main body 28 includes at its lower end upwardly projecting stops 40. In addition an asymmetric, pivotable stop finger 46 is provided against which the basket 50 is held in a first stop position as discussed in more detail below. The
20 basket 50 is preloaded in abutment with the stop finger 46 against springs 42 by plungers 44. The coil springs 42 can be replaced by diaphragm/bell-type springs at the base of the basket providing the required pre-loading between the plunger 44 and the basket 50.

25 The container 22 is removably pivotably mounted on the base 80 and includes carrying handles 48.

The base 80 comprises a reservoir 82 which rests on a supporting surface and a pair of yoke-like supporting arms 84, 86 pivotably carrying the container 22.

At least one of the arms 84 includes a conduit 88 for water flowing from the outlet 36 in container pivot 22a. Accordingly the waste water is conveniently received in the base. The supporting arms 84, 86 preferably carry locking means (not shown) for releasably locking the container 20 in a freely pivoting or fixed position and/or releasing the container 20 for detachment from the base 80. The base is molded from plastics material.

As can be seen in Fig. 2, the basket 50 comprises an elongate body 52 arranged to carry, in the example shown, a row of five bottles 100. The body includes a pair of guide fins 54 at its longitudinal ends which are slidably received in corresponding channels 56 on the inner faces of the container 20. The guide fins 54 terminate at their lower end at a shoulder 58 which abuts the stop finger 46 in the first stop position. The body includes apertures as appropriate both to reduce weight and material, and to allow circulation of steam or hot water. In particular the body 52 includes apertures 53 at its bottom adjacent each bottle 100 through which the stops 40 at the base of the container 20 can project. The basket is molded from plastics material.

The basket body includes various detent formations for engaging corresponding formations on the components of the bottles in various configurations. As shown in Figs. 1 and 6, in a first position the bottle side wall 104 and teat assembly 120 are retained in a raised position with a formation 108 abutting a corresponding formation 110 on the body 52. The base portion 106 is retained at the base of the body 52, spaced from the side wall portion, by projections 112 on the base portion 106 engaging corresponding projections 114 on the body

52. The base portion includes a bottom face 111 and an annular flange 113 projecting upwardly. The bottle 100 is formed of plastics material of appropriate known type and the flange 113 is sufficiently resilient to flex inwardly and disengage the projections 114 if an upwards force is exerted. In a second position, as discussed in more detail below, the base portion 106 is driven into sealed engagement with the sidewall engagement by virtue of co-operating formations 117, 118 on the respective parts and a seal 119. The engagement is by snap fit relying on the resilience of both parts and is releasable in any appropriate known manner. An element of tolerance can be introduced into the snap-fit to enhance reliability and repeatability for example by having some resilience in the basket base.

In order to boil and sterilise water, the basic operation is as discussed above. Once the basket 50 is slid into position, resting on finger 46, and the plungers 44 depressed, the container 20 is inverted, filled and turned upright again, ensuring that no air remains in the bottles 100. The steam vents 35 are opened allowing the element 24 to be heated, and the water is boiled, typically for 4 minutes to ensure that it is sterile. Of course the bottles are yet further sterilised in this operation. After 4 minutes the finger 46 is released, under control of the control means 34, and pivots allowing the basket to be driven downwardly by the loaded plungers. The stops 40 project through the apertures in the base of the basket 50 and drive the bottle base portions 106 out of engagement with projections 114. The sidewall portion 104 of the bottle effectively slides down into sealed engagement with the base portion 106, sealing the bottle entirely filled with sterile water. As the water cools it will contract, creating a negative pressure difference with atmosphere and strengthening the seal.

The sterile bottles can be stored indefinitely as there is no possibility of air contamination, and further batches can be prepared as appropriate. If it is desired to retain the sterilised bottles at feeding temperature (38° C), the container 20 is preferably drained to approximately half its height by use of the outlet 36. This can either be into the base conduit 88 or a sink or other receptacle. This aids speed of cooling and also reduces the weight of the container 20 if it is detached from the base. The temperature of the water drops to and is retained at the feeding temperature by thermostatic control of the element 24 in a known manner. The container can be kept on the base or taken to the bedroom or even in the car attached to a suitable power supply (eg car lighter socket) to heat the element. It will be noted that by appropriate placement of the inlet/outlet for example at the sides of the container, the container does not need to be fully inverted but can simply be rotated through 90°.

15

The feed is then simply prepared by removing a bottle filled with sterile water at the correct temperature, removing the teat assembly 120, draining the bottle to the correct amount of water for the feed and adding the appropriate amount of feed mixture. The draining of the bottle to the correct height can be accurately and speedily metered according to a further aspect of the invention. In particular, as can also be seen in Fig. 6, the bottle 100 includes a dispenser tube 200 mounted at its neck by an apertured flange 202. The tube 200 is provided in the bottle at the boiling stage and is hence fully sterile and in place for preparation of the feed. Preferably the controller 34 includes a suitable suction pump 220 to drain the bottle via the tube 200. The pump includes an inlet 222 arranged to seal against a formation 204 on the flange surrounding the tube 200, such that sterilisation of the pump 220 is not required, as there is no

20

25

contact with the water. The pump 220 may be slidable to different heights on the controller 34 and fastenable by nut 224 to meter the amount of water drained by selecting the distance that the tube 200 extends into the bottle. As can be seen in Fig. 1, which shows the bottle in two possible positions, the pump 220 is connected by a flexible power and fluid conduit line 226 to the controller 34, allowing it to be attached to the tube 200 (right hand position), and mounted at the desired height. A nightlight 228 is provided on the controller 34 to illuminate the operation without the general disturbance of turning on the room lights in night-time operation.

The feed mix can be pre-prepared in the correct quantity such that once the tube assembly 200 is discarded the mix is poured in, the teat assembly replaced, and the feed prepared, uncontaminated and at the correct temperature. The entire process can take as little as 15-20 seconds, a very significant improvement on existing preparation times with no compromise in hygiene.

Further aspects of the invention will now be described. The teat assembly 120 comprises a teat 121 which can be of a suitable known type, and a cover 122. It will be noted that the profile of the cover 122 unconventionally follows the profile of the teat 121 closely, to minimise deformation of the teat during boiling. The teat 121 is held against the bottle body in a known manner by a flange 124 which screws onto the bottle neck with the teat 121 projecting through. The cover 122 also seals against the flange 124 via annular seal 126. The cover also seals in a water tight and air tight manner against an annular projection 128 on the teat 121, and against the tip of the teat.

The components of the teat assembly 120 can be sterilised in any appropriate manner. Preferably the teat 121 and cover 122 are steam sterilised and retained in a holder 130 (Fig. 3) which also seals the base of the teat 121 such that the teat and cover 122 are sealed from air contamination. A particularly preferred manner of doing this is shown in Fig. 1 and Fig. 7. It will be seen that an additional basket 230 including an open-ended body 232 and a top cover 234 having steam vents 236 is provided. The additional basket 230 includes the holder 130 on which the teat 121, flange 124 and cover 122 are retained on formations spaced from one another. In particular the flange 124 rests on leaf springs 238 which flex out of engagement under a downward force. The additional basket 230 is of similar dimensions in plan to the container 20, containing an equivalent number of teat assemblies 120, and is arranged to clamp to the top of the container 20 such that steam passes into the additional basket through the steam vents to sterilise the teat assemblies 120. The holder 130 has apertures 131 to allow the steam to circulate.

The additional basket includes a plunger 240 which is preferably of a T-shape to abut the tops of two adjacent covers 122. The plunger 240 is coupled to the plunger 44 in any suitable manner. As a result, when the plunger 44 springs down, the covers 122 are correspondingly driven down, pushing the flanges 124 down and sealing the cover 122, flange 124, teat 121 and holder 130 together, where they are locked by the leaf springs 238. It will be noted that the holder 130 includes an upward annular projection 132 against which the flange 124 seals the teat 121, providing an entirely air tight sterile assembly. Accordingly, once again, the teat assembly 120 is sealable in a sterile state against contamination and can be stored for a long period of time. As a result, the teat assemblies can be sterilised in batches as well. It will be appreciated

that the additional basket can be configured to mount inside the container 20 for steaming if desired.

Referring to Fig. 5, it will be seen that the basket 50 is preferably further
5 configured for optimum steaming, in particular in an arrangement in which,
instead of the additional basket 230, the basket 50 is placed on top of the
container 20, whilst another basket 50 is in the container 20, in boiling water.
As a result an additional batch of bottles is pre-steamed whilst a first batch is
boiled, simply making use of the waste steam. The basket preferably has
10 internal formations 250 in the form of shoulders at various heights holding the
various bottle components – cover 122, teat 121, flange 124, tube assembly 200,
sidewall portion 106, base portion 106 - spaced from one another for steaming.
As shown, additional inserts 252 may be provided resting on the shoulders 250
and supporting the various components. In addition a further plastic cover, for
15 example of moulded plastic (not shown) can be placed over the additional
basket 30 or basket 50, to retain heat in the steaming phase.

A further preferred embodiment of the invention is shown in Figs. 8 to 10. The
principle of operation of the steriliser remains the same, and the main difference
20 with this further, preferred embodiment, is that the container 300 and basket
310 are circular in cross-section, the basket 310 being configured to receive
seven bottles 320 as can best be seen from Fig. 9. The basket is slid into
position by guide fins 330 at 180° to one another and held in place by a stop
finger 340. In this embodiment three plungers 322 at 120° intervals preload the
25 basket 320 such that the bottles are driven to seal when the stop finger 340
releases, in the same manner as discussed above. The arrangement is shown
once again with a heating element 302 raised above the base of the container

300 but it will be appreciated that a flat, integral heating element provided in the base of the container 300 can equally well be used and is particularly advantageous in providing quick and efficient heating and avoiding limescale.

5 The circular configuration of the embodiment gives rise to various advantages. Firstly construction and in particular moulding of the arrangement is improved. The arrangement is generally more compact and can, for example, sit on a kitchen work surface without taking up excessive amounts of space. In the embodiment shown, the drain through the pivot into the base is no longer
10 required; instead as can best be seen in Fig. 10, an orifice 340 is provided in the centre of the cover 304 for the main body 300. As a result in order to empty or partially empty the container for the reasons discussed above the user simply has to position the unit next to a sink or other drainage point and pivot the container 300 about the base. Preferably a stop is provided on the base which
15 can be engaged to ensure that water is only drained to the desired level. As can be seen from Fig. 8 an additional basket 306 can be placed on top of the container 300 allowing its contents to be steamed as discussed above. The outlet orifice 340 preferably comprises the steam outlet as well. The additional basket 306 evidently is also of circular cross-section providing a compact and
20 easy to manufacture element.

An improved pump system is also shown in the arrangement set out in Figs. 8 to 10 and it will be appreciated that this pump system can, as all of the other
relevants of Figs. 8 to 10 where appropriate, be incorporated into the other
25 embodiments discussed herein. In particular the pump 350 is slidably mounted on a housing 352 and includes an inlet 354 arranged to fit over a tube 200 of a bottle as discussed above. A detent such as a pawl (not shown) may be

provided to lock the pump at a desired height and the pawl itself may be moveable and releasable as appropriate in any suitable fashion. As a result the two-step process shown in Fig. 1 of fitting the pump and then moving the bottle into position is not required. Instead the teat and flange are removed from the bottle and the bottle is placed in position under the pump 350. The pump 350 is released to slide downwardly such that the inlet 354 engages the tube 200 and the pump is then slid up until it locks with the pawl at the desired height. When the bottle has been drained to the correct height the pawl can be released to allow the pump 350 to be slid out of engagement with the bottle allowing the final feed preparation steps to take place.

It will be appreciated that alternative embodiments may be contemplated, and that features from the various embodiments are interchangeable as appropriate. For example, the bottle body can be a single integral piece onto which the teat flange is driven including the tube assembly and a top seal, again to seal the sterile water against contamination. Furthermore, instead of a spring loaded plunger arrangement, the bottles can be sealed by plungers operated manually from the exterior of the container. The bottle bodies can be sealed independently of the teats/teat assemblies and these attached at the time of feeding. In order to avoid the container inversion step the bottles may have side walls of thin enough material that there is sufficient heat transmission to remove the need to have an open end facing down during boiling. For example, the bottle may comprise a flexible membrane of plastics material for holding the feed.

Examples of proposed alternative arrangements are shown in Figs. 11a to 11c. Referring firstly to Fig. 11a a bottle shown generally at 400 includes a bottle

body 402 having side walls and a base. A teat assembly 404 is a snap-fit onto the bottle body 402. Bottle body 402 includes a shoulder 406 over which a corresponding projection 408 on the teat assembly 404 snaps. The teat assembly 404 in particular includes a flange 410 including the snap 408, a cover 412 including a flange 414 that is a bayonet fit in a corresponding formation 416 on the flange, and a teat 418 of known type. The cover 412 further includes a substantially cylindrical lower part 420 extending into an annular recess 422 formed by a doubled portion of the teat 418. As a result when the teat assembly 404 is snapped down onto the bottle body 402 a seal is formed between the cover, the teat and the side wall of the bottle body. In addition the teat air hole is closed by the cover 412.

It will be recognised that the arrangement shown in, for example, Fig. 1 is merely reconfigured such that instead of the bottle body snapping down on to a base, the bottle body snaps down on to the teat assembly or vice versa in any appropriate manner. Once again a fully sealed and sterile container can thus be obtained. To open the container the cover is simply twisted until the projections 414 rotate past the bayonet formation 416 allowing the cover to be removed.

An alternative fixing arrangement shown at 424 is illustrated in more detail in Fig. 11b. In this case the bottle body 402 remains the same but the teat assembly 404 is formed of fewer parts. In particular, in addition to a teat 418 there is provided an integral cover and flange 426. The flange includes a snap-fit member 408 as previously described and a projection 428 retained once again in a doubled over portion 422 of the teat to form a seal against the bottle body 402. The flange includes a weakened annular frangible portion 430 by which it is joined to the cover portion 432. As a result the cover portion 432

can simply be twisted or pulled off to open the container. Operation of the system is otherwise similar to that shown in Fig. 11a and in particular a dispenser tube 432 can be provided (as can be the case for Fig. 11a) as discussed in more detail in relation to Fig. 6. The arrangement of Fig. 11b allows the user to provide a common bottle body 402 and then select between a re-useable system as shown in Fig. 11a or a disposable system as shown in Fig. 11b.

Referring to Fig. 11c a further alternative arrangement is shown. A bottle body 402 comprising the base and side walls is filled with sterilised water as discussed above and then snap-fitted against a simple cover 450 as discussed in relation to the other embodiments. As a result a sealed, airtight sterilised water bottle is formed which can be maintained indefinitely as with the other embodiments discussed herein. In addition, a sealed teat assembly 452 can be provided as discussed in more detail above comprising a teat cover 454, a teat 456 and an assembly cover 458. The teat cover 454 has a snap-fit to the assembly cover 458 and an airtight seal is formed between an annular formation 460 on the teat cover, a doubled-over portion 462 of the teat 456 and an inner wall of the assembly cover 458. To assemble the bottle, therefore, the cover 450 is removed from the bottle body and the assembly cover 458 is removed from the teat assembly 452, and the two parts are snap-fitted together.

The baskets can of course hold the bottles in any desired arrangement, for example two rows of three. Of course any shape of bottle can be accommodated by appropriate modification of the basket. The arrangement can be used without the base although this will require additional operator effort in inverting and filling the container.

Claims

- 5 1. A steriliser for a feeding bottle having an open bottle body and a closure comprising a sterilising medium reservoir, means for retaining an open feeding bottle body immersed in and filled with the sterilising medium and means for sealing the closure against the bottle body in its filled state.
- 10 2. A steriliser as claimed in claim 1 in which the sealing means comprises means for biasing the bottle body and closure towards one another, and detent means for retaining the bottle body and closure apart in a first position, and for releasing the bottle body and closure to seal against
- 15 each other in a second position.
3. A steriliser as claimed in claim 1 or 2 further comprising a holder for at least one bottle body and closure insertable into the reservoir.
- 20 4. A steriliser as claimed in claim 3 in which the holder is arranged to slide relative to the reservoir, and one of the bottle body and closure are arranged to slide relative to the holder and remain fixed relative to the reservoir, to seal the closure against the bottle body.
- 25 5. A steriliser as claimed in claim 4 in which the reservoir includes a stop arranged to retain one of the bottle and body fixed relative to the reservoir as the holder slides, to seal the closure against the bottle body.

- 5
6. A steriliser as claimed in any preceding claim in which the reservoir is pivotally mounted relative to a base, and has a sterilising medium inlet at its lower end.
7. A steriliser as claimed in any preceding claim in which the reservoir has a sterilising medium outlet communicating with a waste reservoir in a base.
- 10
8. A steriliser as claimed in any preceding claim in which the reservoir is detachably mounted to a base.
9. A steriliser as claimed in any of claims 6 to 8 further comprising a base to which the reservoir is mounted.
- 15
10. A steriliser as claimed in any preceding claim further comprising control means for initiating sealing of the bottle body and closure after a predetermined sterilising period.
- 20
11. A steriliser as claimed in any preceding claim comprising a heating element and in which the sterilising medium is water.
12. A steriliser as claimed in claim 10 in which the reservoir is substantially water and gas tight, and includes openable steam vents and means for
- 25
- sensing an open state of the vents to allow heating.

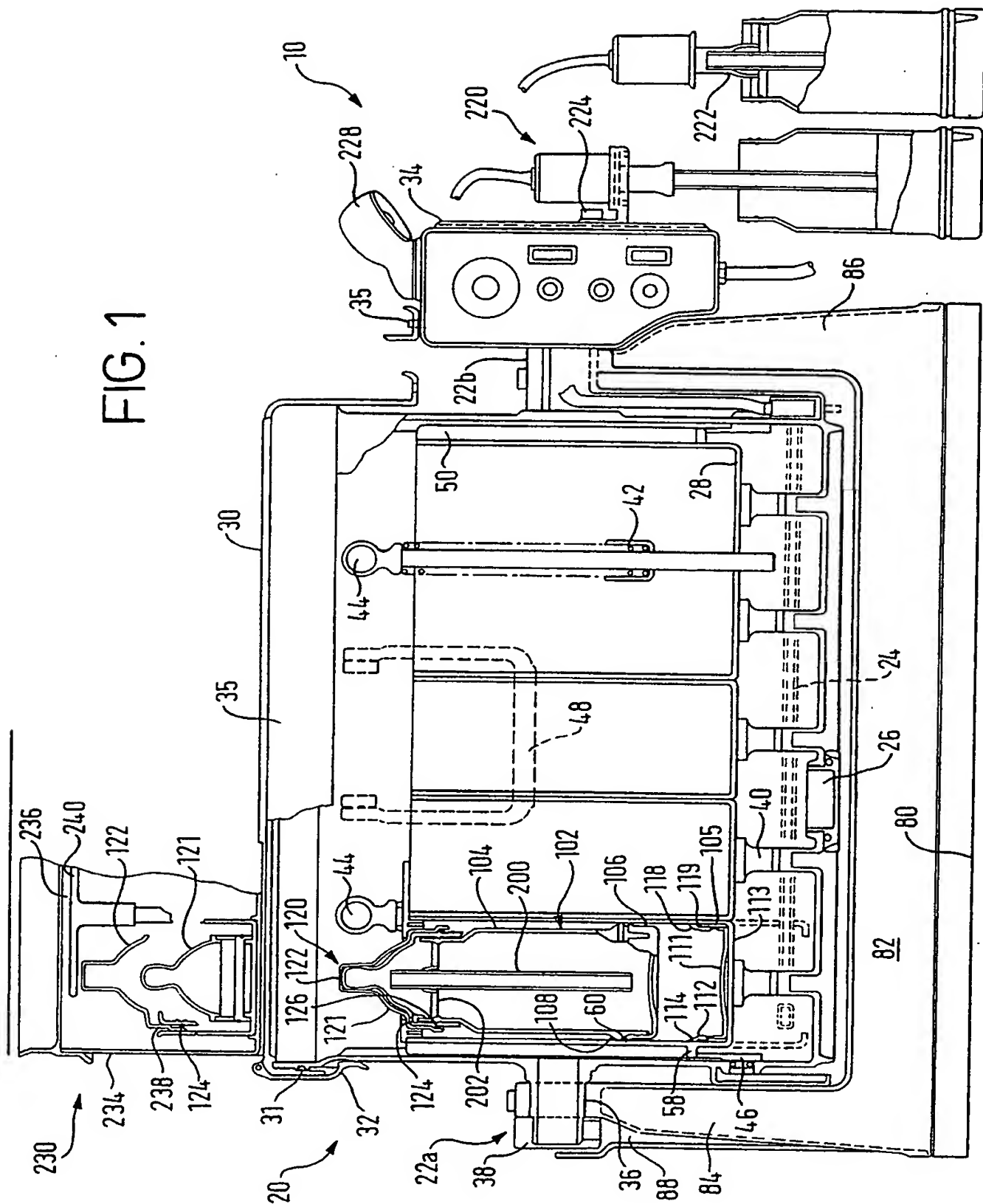
13. A feeding bottle holder for a steriliser as claimed in claim 12 comprising a body including a plurality of formations for holding one or more of a bottle body, closure, teat, teat collar, and teat cover in spaced relation for steam sterilising, and a further plurality of formations for holding said closure and said bottle body spaced from one another and movable into sealing engagement with one or another.
14. A steriliser as claimed in claim 12 further comprising a holder for a teat arranged to be attached to the reservoir in communication with the vents to allow steam sterilising of the teat.
15. A feeding bottle for a steriliser as claimed in any preceding claim in which the bottle body comprises bottle side walls, and the closure comprises a bottle base which is a sealing snap fit with the side walls.
16. A feeding bottle comprising a bottle body and an outlet conduit extending into the bottle body such that the bottle is drainable via the conduit to a predetermined depth.
17. A feeding bottle drainage unit comprising a feeding bottle as claimed in claim 16 and a pump arranged to engage the outlet conduit to drain the bottle to the predetermined depth.
18. A teat assembly for a feeding bottle comprising a teat, a collar for mounting the teat to a feeding bottle body, a cover sealable against the collar, and a sealing holder including a formation against which the collar seals the teat in a substantially gas- and water tight manner.

19. A teat assembly as claimed in claim 18 in which the cover has a profile substantially similar to the teat profile.
- 5 20. A feed preparation unit comprising a sterilisation container comprising a heating element, water inlet and outlet, and means for holding feeding bottle components for steam sterilisation or water heating in the container.
- 10 21. A feeding bottle for a steriliser as claimed in any of claims 1 to 14 in which the bottle body comprises bottle side walls and a bottle base, and the closure comprises a cover for the bottle body which is a sealing snap-fit with the side walls.
- 15 22. A feeding bottle as claimed in claim 21 in which the closure comprises a teat assembly.
- 20 23. A method of sterilising a feeding bottle in a sterilising medium reservoir comprising the steps of immersing an open bottle body in a sterilising medium, filling the feeding bottle body with the sterilising medium and sealing the closure against the bottle body in its filled state.
- 25 24. A method as claimed in claim 23 in which the immersing step comprises rotating the reservoir to ensure complete filling of the bottle body.

25. A steriliser, feeding bottle, drainage unit, teat assembly or feed preparation unit substantially as herein described and as illustrated in the accompanying figures.

1/8

FIG. 1



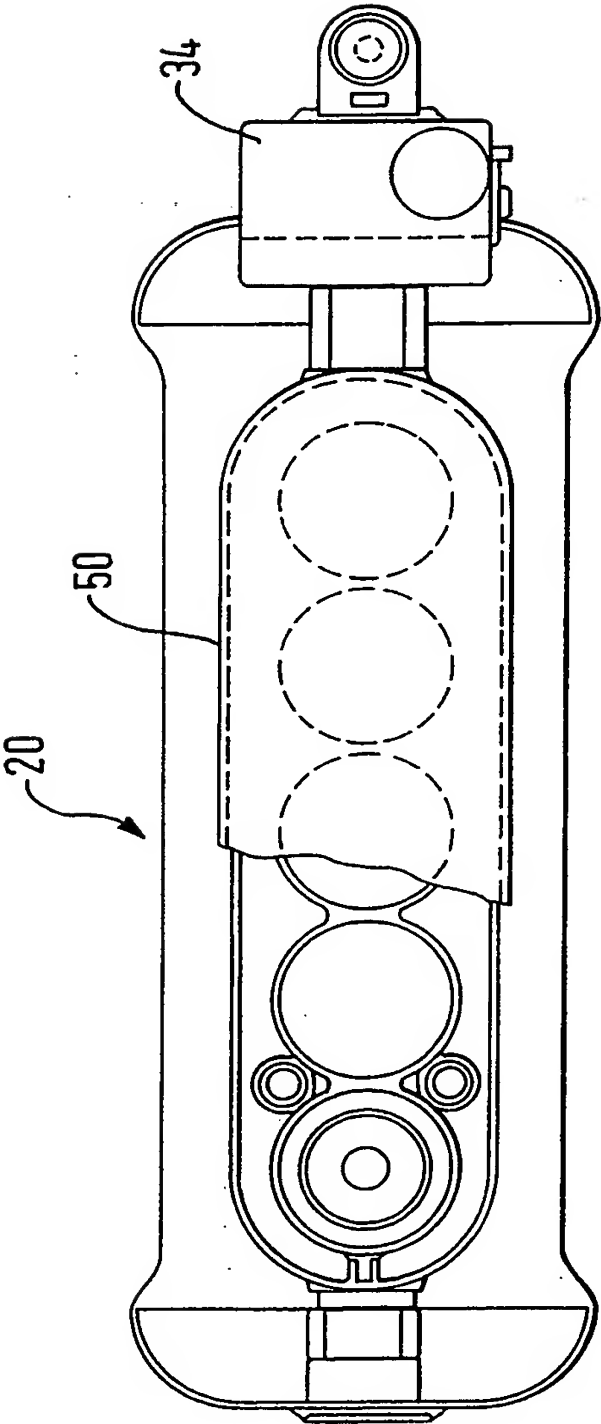


FIG. 2

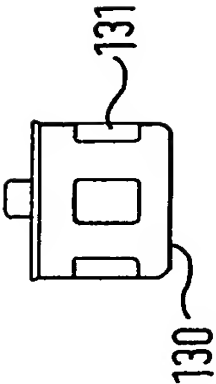


FIG. 3

3/8

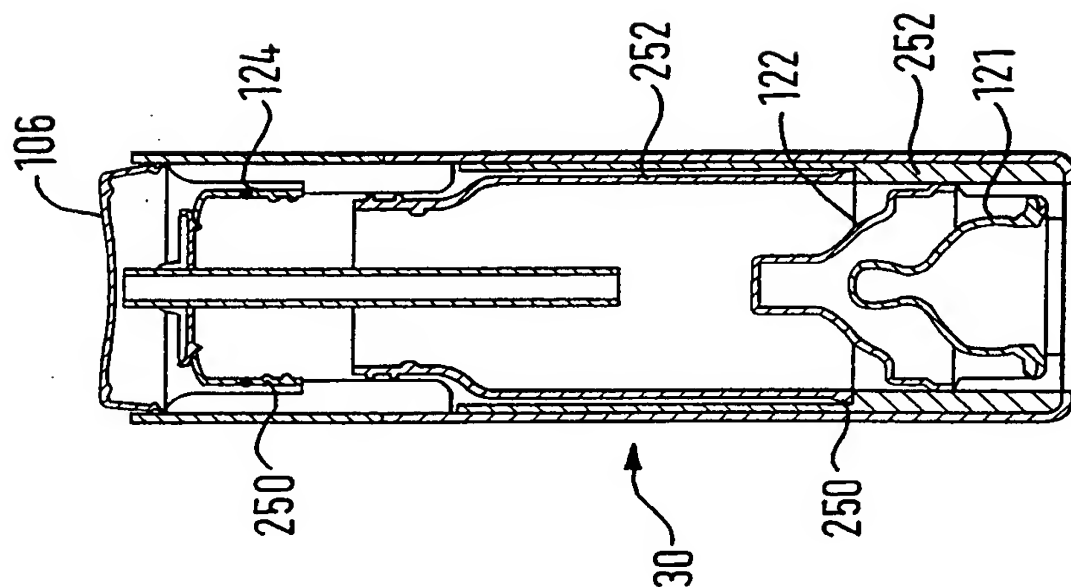


FIG. 5

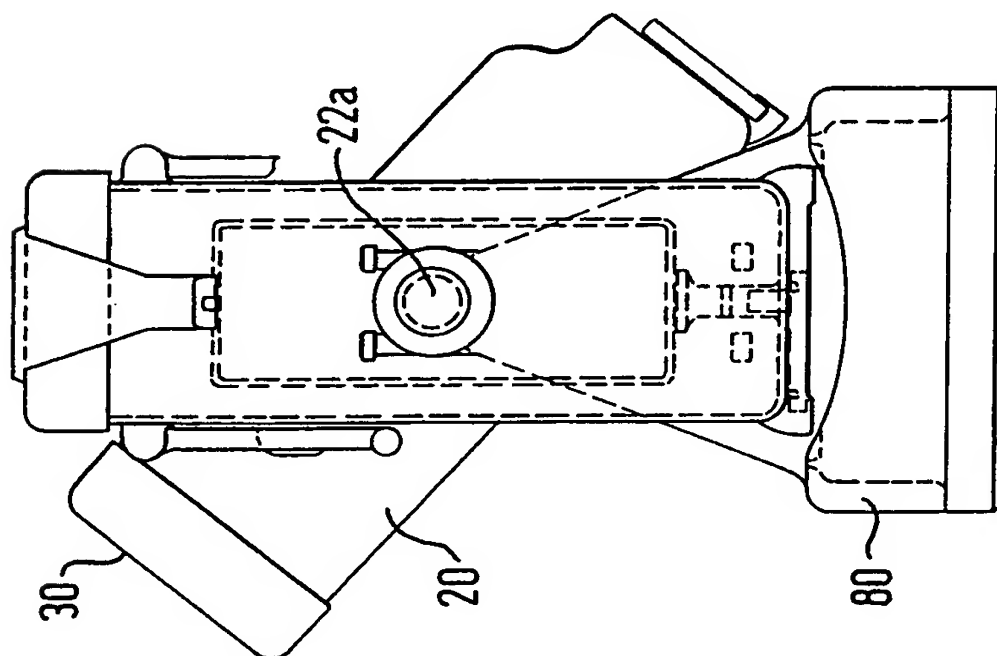


FIG. 4

4/8

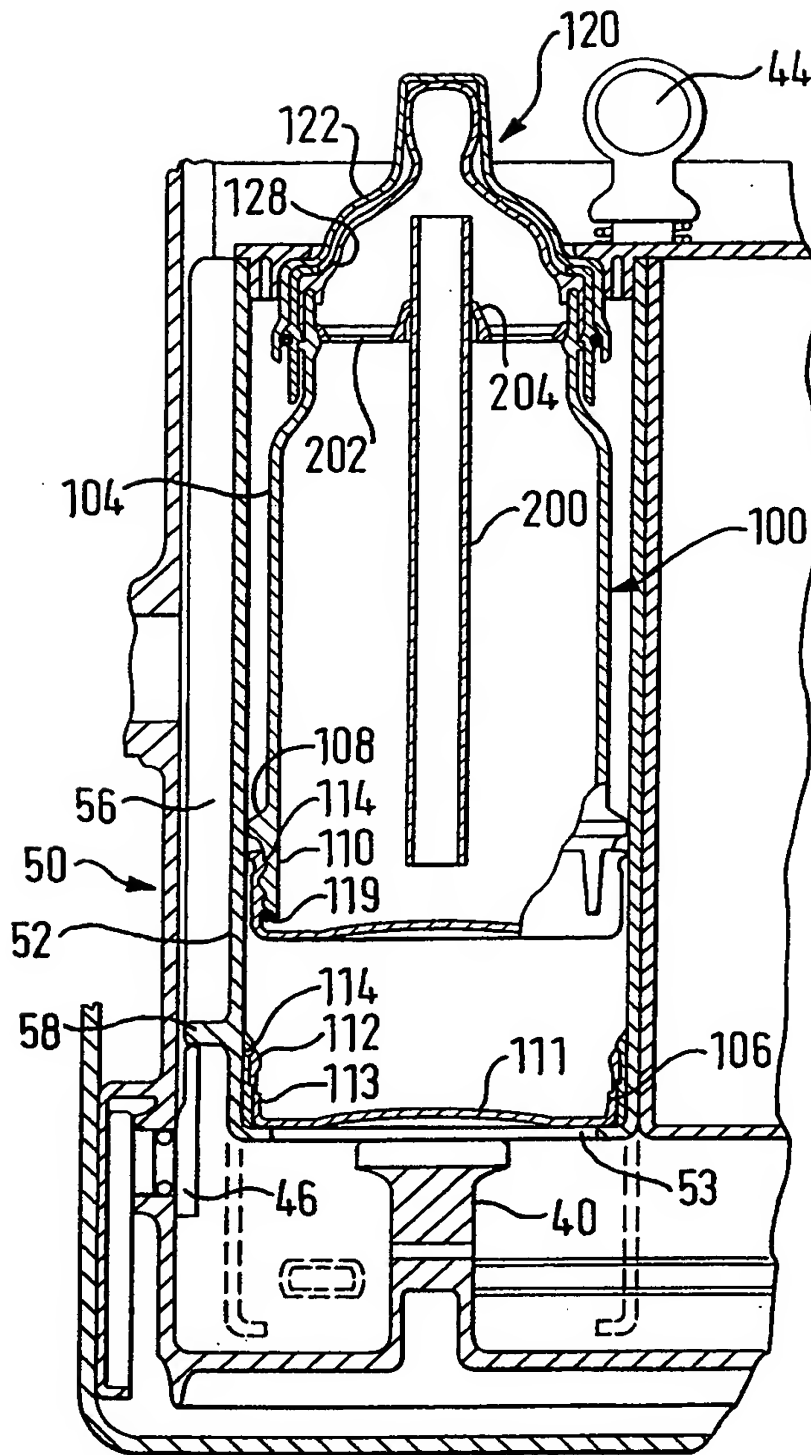
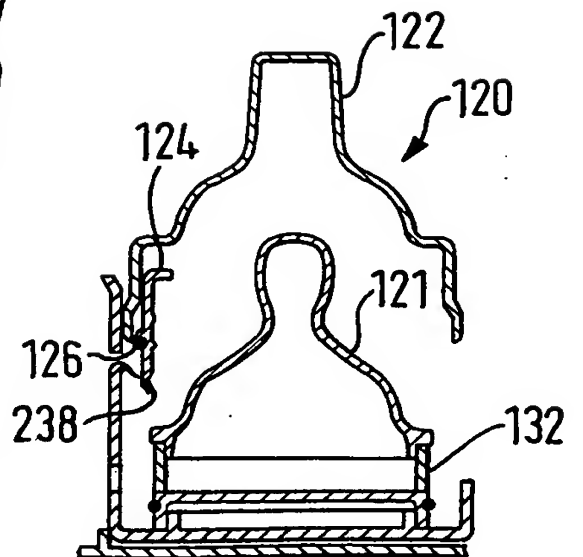


FIG. 6

FIG. 7



5/8

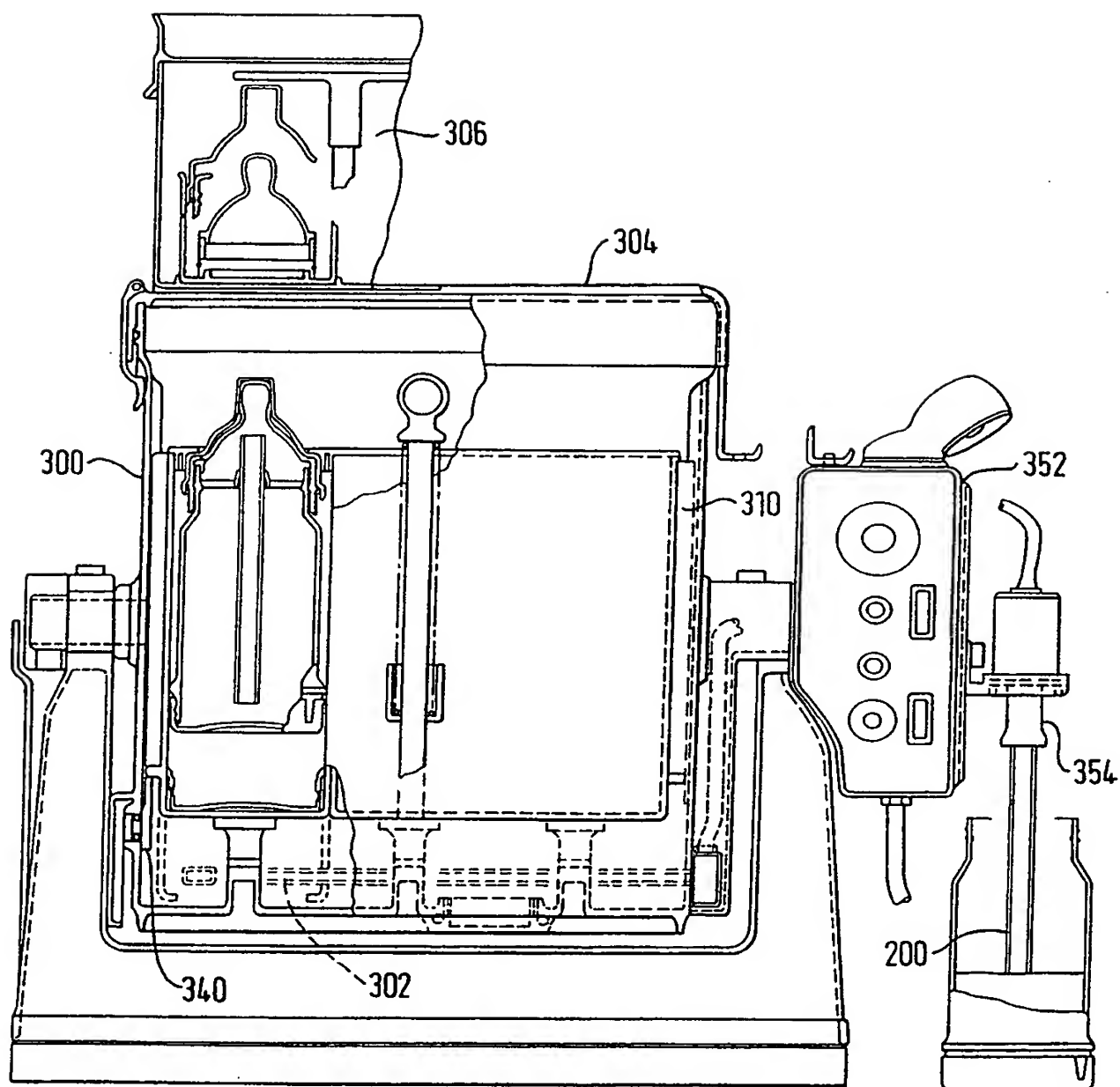


FIG. 8

6/8

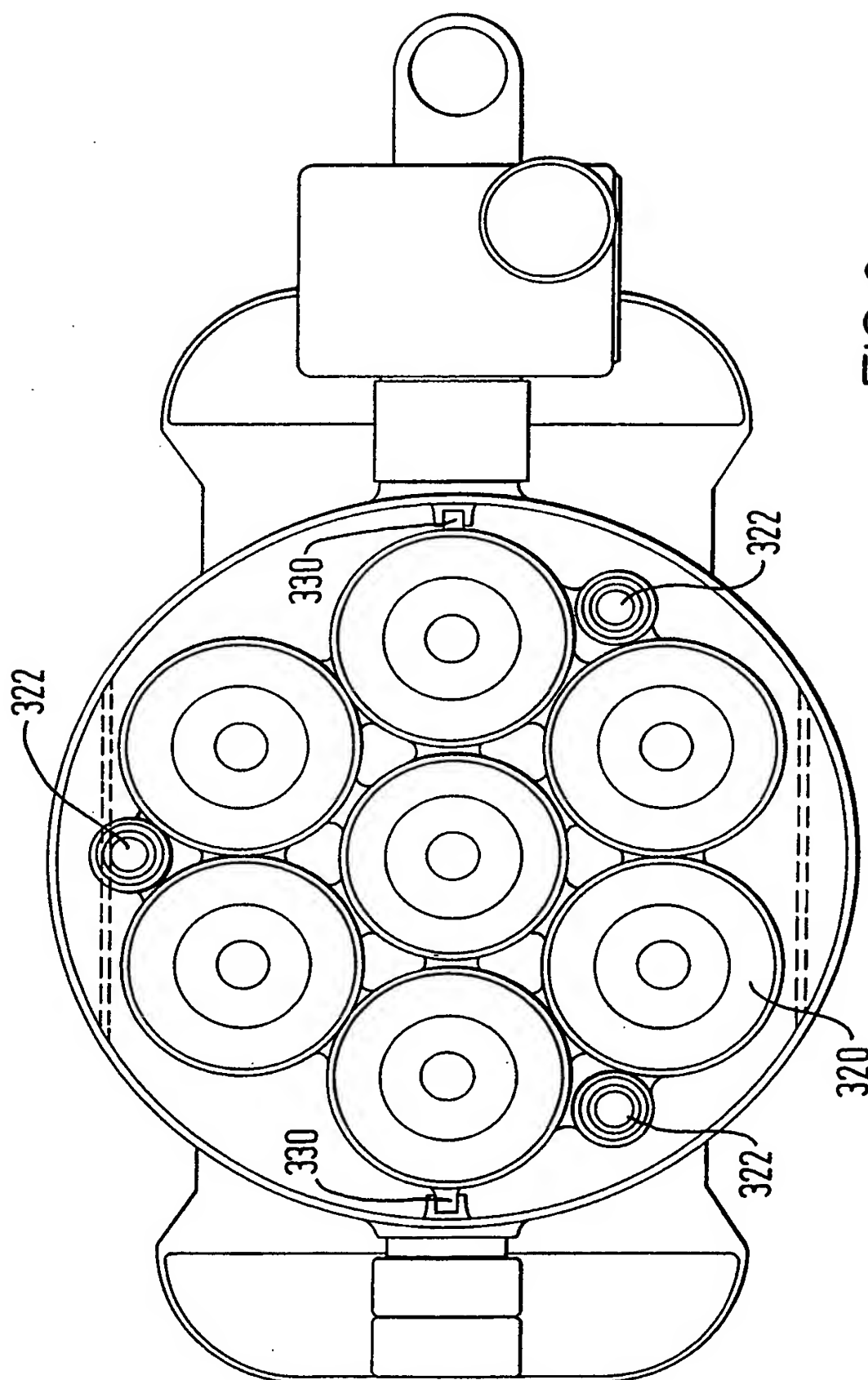


FIG. 9

7/8

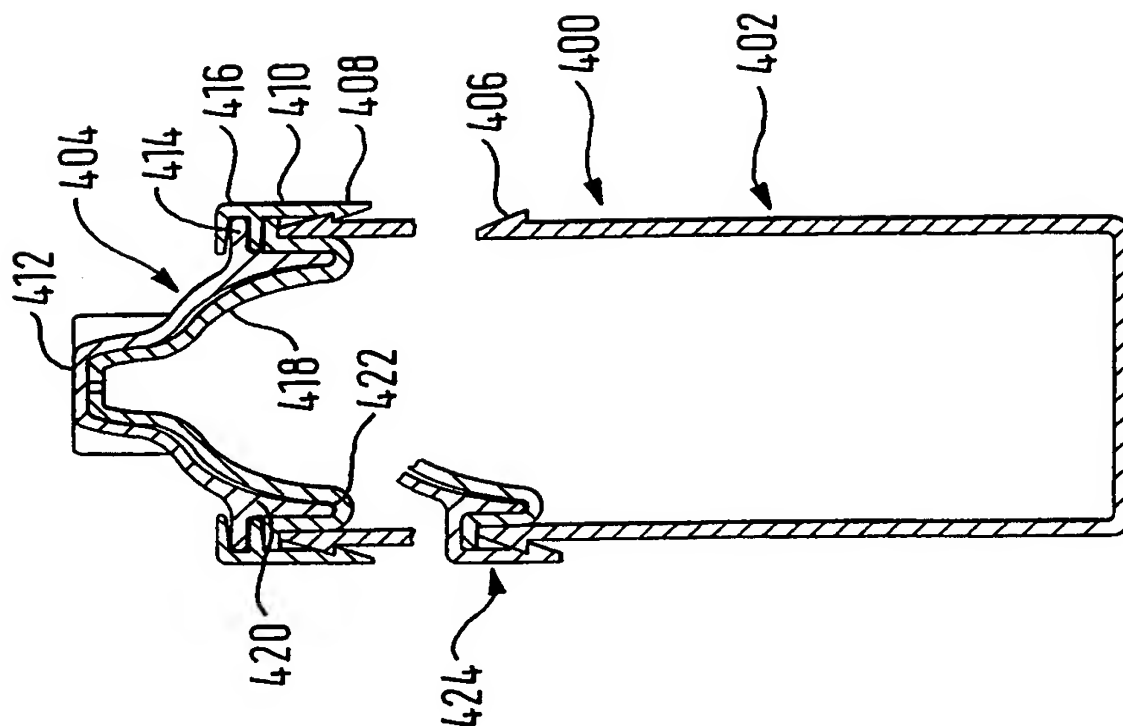


FIG. 11a

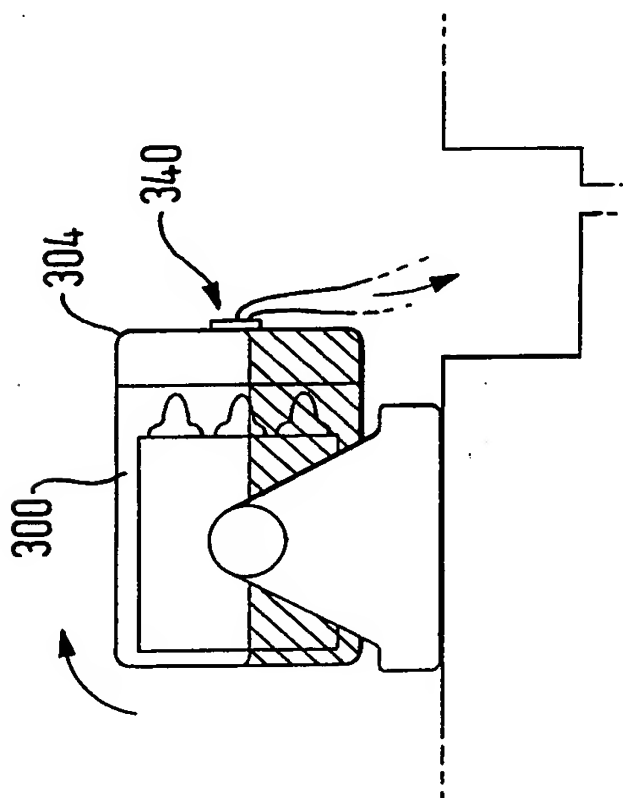


FIG. 10

8/8

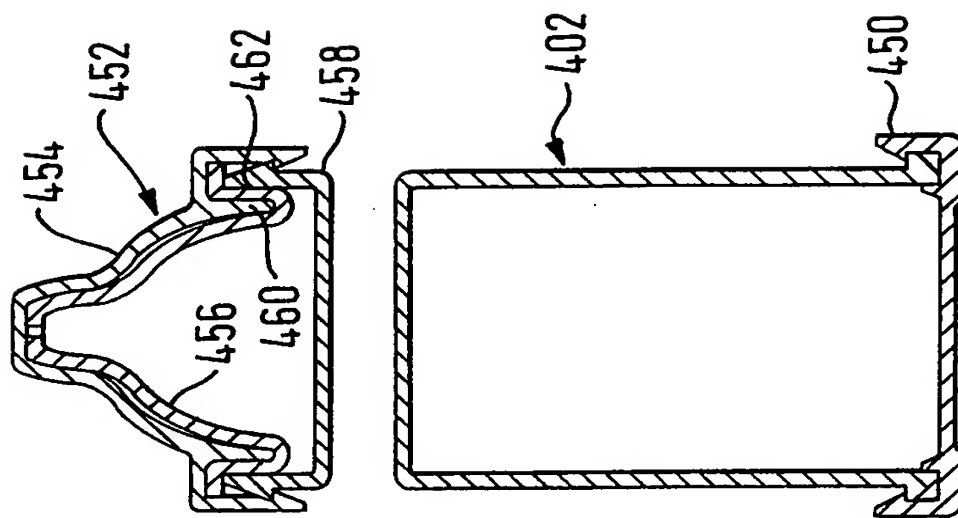


FIG. 11c

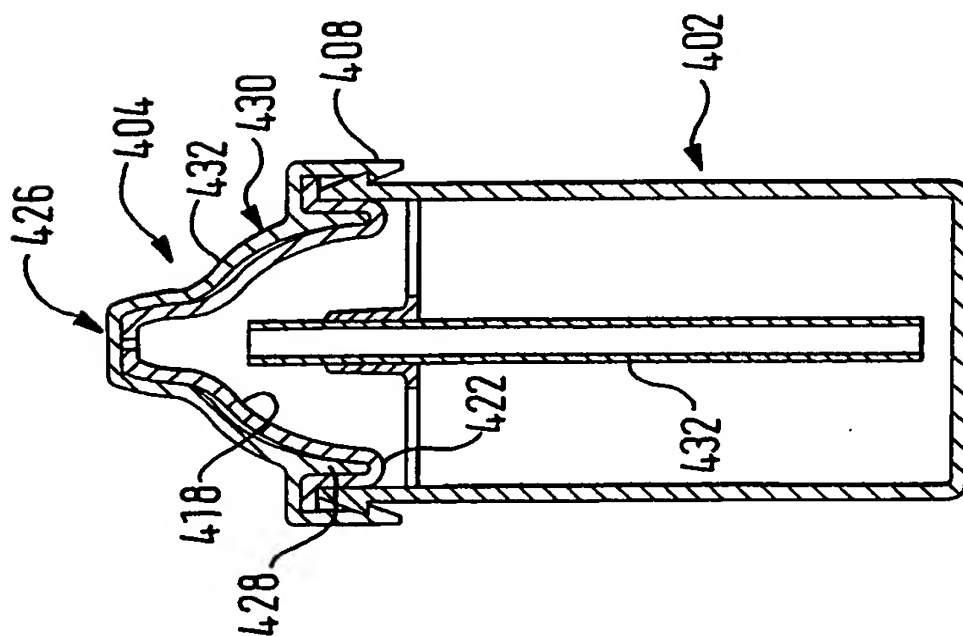


FIG. 11b

International Application No
PCT/GB 00/00928

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L2/06 A61L2/24 A61L2/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61L A47J A47L B65B B67C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 058 276 A (PALMA J R) 6 October 1962 (1962-10-06) column 3, line 33 -column 4, line 36 column 6, line 50 -column 7, line 32 claims	1-5, 11, 15, 18-23, 25
X	DE 43 32 241 A (KRONSEDER MASCHF KRONES) 30 March 1995 (1995-03-30) column 2, line 20 - line 26 claims	1, 11, 20, 23
X	WO 89 02239 A (RECH DE L ECOLE NATIO SOC ET) 23 March 1989 (1989-03-23) figure 1 claims	20 1, 11
A		

Y Further documents are listed in the continuation of box C.

X Patent family members are listed in annex.

* Special categories of cited documents :

- * "A" document defining the general state of the art which is not considered to be of particular relevance
- * "E" earlier document but published on or after the international filing date
- * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- * "O" document referring to an oral disclosure, use, exhibition or other means
- * "P" document published prior to the international filing date but later than the priority date claimed

- "T"** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X"** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y"** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&"** document member of the same patent family

Date of the actual completion of the international search

9 June 2000

Date of mailing of the international search report

20/06/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3018

Authorized officer

Thornton, S

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/00928

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No. .
X	WO 97 47224 A (PAUL CLAIRE CECILIA) 18 December 1997 (1997-12-18) page 14, line 19 - line 35 figure 4	20
A	claims -----	1,11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/00928

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3058276	A	06-10-1962	NONE	
DE 4332241	A	30-03-1995	NONE	
WO 8902239	A	23-03-1989	FR 2620017 A	10-03-1989
WO 9747224	A	18-12-1997	AU 3041597 A EP 0910268 A	07-01-1998 28-04-1999